Alaska Department of Fish and Game
Division of Wildlife Conservation
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Evaluation and Testing of Techniques for Ungulate Management

Kris Hundertmark

Research Performance Report
1 July 2001–30 June 2002
Federal Aid in Wildlife Restoration
Grant W-27-5, Study 1.56

This is a progress report on continuing research. Information may be refined at a later date.

FEDERAL AID
ANNUAL RESEARCH PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Evaluation and testing of techniques for ungulate management

PRINCIPAL INVESTIGATOR: Kris Hundertmark

COOPERATORS: Kenai National Wildlife Refuge

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR.: W-27-5

PROJECT NR.: 1.56

WORK LOCATION: Kenai Moose Research Center, Soldotna

STATE: Alaska

PERIOD: 1 July 2001 – 30 June 2002

I. PROGRESS ON PROJECT OBJECTIVES

OBJECTIVE 1: To provide for activities and expenses associated with maintaining and operating the Kenai Moose Research Center.

Maintenance and operations activities of the Moose Research Center were conducted to facilitate research activities. Those activities include animal care as well as maintenance of roads, buildings, and fences.

OBJECTIVE 2: To allow for continued evaluation of immobilization drugs used in the capture and handling of moose and caribou.

No new immobilizing drugs have been tested. OBJECTIVE 3: To continue to evaluate new techniques and equipment for monitoring reproductive activities such as remote determination of breeding and calving dates.

Three years of data have been collected regarding the effectiveness of the Heatwatch System for detecting breeding events in caribou. It appears to be an effective system, and certainly is superior to visually confirming mating events.

OBJECTIVE 4: To identify indices of body composition and energy and protein balance.

We continue to collect data on the relationship between ultrasound estimates of subcutaneous fat, metabolites in serum and urine, and body composition in moose and caribou. Moreover, through collaboration with Dr. Duane Keisler, we have identified a

potential assay for leptin in moose. We analyzed preliminary data regarding the relationship between serum leptin and percent body fat.

OBJECTIVE 5: To allow for evaluation of new and innovative techniques that may be useful for ungulate management.

OBJECTIVE 6: To improve methods for chemical determination of digestibility of plants, to develop additional assays plant chemical defenses, and to develop a standard nutritional database for forages of moose across Alaska.

OBJECTIVE 7: To quantify the relative contributions of dietary nutrients (energy and protein) and nutritional reserves toward caribou performance.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB 1: Development of research proposals

Due to staff turnover, no work was accomplished during this period.

JOB 2: Maintenance and operations

Maintenance and operations activities of the Moose Research Center were conducted to facilitate research activities. We fed and cared for an average of 20 moose and 22 caribou during this period. We cleared trees and brush and replaced rotting wooden posts with steel drillstem along 1.5 miles of fence. We replaced the deteriorating asphalt shingled roofing above the handling facility with steel roofing.

JOB 3: Caribou physiology and reproductive status

Heatwatch transmitters were affixed to 6 adult female caribou during routine vaccination procedures in early September. Breeding events of 5 cows were detected by the Heatwatch system on October 8, 9, 9, 11, and 12. One transmitter fell off and no breeding event was detected or subsequently observed. Three of the five cows gave birth to live calves on May 24, 25, and 26. One cow (breeding event detected on October 8) died on May 9 from complications associated with pregnancy, a second cow (breeding event detected on October 12) did not give birth, and a third cow (the case where the transmitter fell off) did not give birth. The 228 day mean gestation period for the three cows is similar to the long-term average of 223 days. The data suggest the Heatwatch estrus detection system is an accurate and useful method of remotely monitoring breeding activity.

JOB 4: Moose digestion and physiology studies

Recent development of assays for fecal glucocorticoid (GC) metabolites has provided a non-invasive means to assess a variety of human-induced disturbances and environmental conditions of free-ranging animals. Fecal samples are easy to collect year-round and provide an integrated reflection of all GC secretion over the previous 1-2 days. However, species-specific differences in steroid metabolism necessitate validation of the assay used to quantify GC secretion. A pharmacological challenge with adrenocorticotropic hormone (ACTH) can establish whether fecal assays accurately reflect acute adrenal activation. In

vertebrates, ACTH administration mimics a natural adrenal stress response by causing a rapid rise in GC circulation followed by a return to baseline within a few hours. The same pattern should occur in feces, with the onset of the peak excretion delayed by a species-specific lag time. A previous attempt to determine high cross-reactivity of the ICN [125 I] antibody to the major GC metabolites of moose proved inconclusive. In that case, we administered 1 IU/kg of ACTH to an adult male and adult female moose. A significant increase in GC metabolite excretion occurred at about 22 hours in the bull, but levels in the cow remain unchanged. We repeated the challenge with the cow, this time increasing the ACTH dose to 3 IU/kg, and detected a significant increase in GC metabolite excretion at about 24 hours. The delay of 22-24 hours for the onset of peak GC excretion in moose was similar to that found for other large ungulates. In addition, accuracy and parallelism tests indicated that interference from other substances in the feces was negligible and that the antibody binds with serially diluted GC metabolites in a dose-dependent manner. We conclude there is enough evidence to demonstrate the assay is suitable for use in moose.

We collaborated with Dr. Ansgar Aschfalk, Norwegian Veterinary Institute, in the assessment of the response of moose to Salmonella infection. We did this by injecting captive animals at the MRC with a Salmonella vaccine and sampling blood prior to and after the injection to detect any increase in antibodies. The results of the trials will be used to assess the exposure of wild moose populations, primarily in Scandinavia, to Salmonella through exposure to domesticated livestock, particularly reindeer. Dr. Aschfalk is currently analyzing those data.

JOB 5: Preparation of reports and technical publications

III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

A publication describing observations of predation on wolverines and a marten by wolves was revised for publication.

White, K. S., H. N. Golden, K. J. Hundertmark and G. R. Lee. In press. Predation by Wolves, *Canis lupus*, on Wolverines, *Gulo gulo*, and an American Marten, *Martes americana*, in Alaska. Canadian Field-Naturalist.

IV. PUBLICATIONS

Hundertmark, K. J., and C. C. Schwartz. 2002. Evaluation of bioelectrical impedance analysis as an estimator of moose body composition. Wildlife Society Bulletin 30: in press.

Bubenik, G. A., and K. J. Hundertmark. 2002. Accessory antlers in male Cervidae. European Journal of Wildlife Research 48:10-21.

V. RECOMMENDATIONS FOR THIS PROJECT

None

VI. APPENDIX

EVALUATION OF BIOELECTRICAL IMPEDANCE ANALYSIS AS AN ESTIMATOR OF MOOSE BODY COMPOSITION

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Abstract: Estimation of body composition of wild ungulates yields important information regarding nutritional status of individuals and populations, yet there are few suitable field techniques that are nondestructive, unbiased, precise and quick to perform. We tested the suitability of bioelectrical impedance analysis (BIA) as an estimator of body composition of moose (*Alces alces*) for use in the field. A derived BIA variable, impedance volume, was a significant predictor of body fat (mass and percentage) and body water (mass and percentage) when sex was added to models as an indicator variable but explained only 48–57% of variation in composition. Best predictive models included impedance volume, sex, body mass and a body mass × sex interaction. Due to difficulty of measuring body mass of moose in the field, we also generated predictive models when body mass was replaced with a proxy (length × girth^2). Predictive equations for body water were more precise than were those for body fat. Impedance estimates decreased as the subject's hind leg was straightened, indicating that animal positioning must be standardized to minimize bias. Lack of precision made BIA unsuitable for estimating body fat of moose in the field. BIA was a precise and quick estimator of body water in moose, but its limitations made it more suitable for the laboratory than the field.
Wildlife Society Bulletin 00(0): 000–000

Accessory antlers in male Cervidae

G. A. Bubenik and K. J. Hundertmark

Accessory (supernumerary) antlers are an infrequent phenomenon in male cervids. These bony protuberances grow mostly from permanent pedicles, which developed in response to a repeated or a severe trauma to frontal, nasal or parietal bones. They regularly undergo seasonal mineralization, casting and regrowth and may persist for many years. Three examples of accessory antlers in telemetacarpal cervids, roe deer (*Capreolus capreolus*), white-tailed deer (*Odocoileus virginianus*) and moose (*Alces alces*), are presented. The initiation of accessory antlerogenesis, the progress of growth and development, and the mineralization and casting of accessory antlers were mostly identical or similar to processes observed in the antlerogenesis of lateral antlers. The antlerogenic property of the competent periosteum, located within the "antler territory" appears to play a crucial role in the development of accessory antlers, which were observed in several antlerogenic cycles, is discussed in relationship to the origin of deciduous antlers in extinct ancestors of cervids.

VII. PROJECT COSTS FOR THIS SEGMENT PERIOD

FEDERAL AID SHARE $ 96,743 STATE SHARE $ 32,248 = TOTAL $128,991

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